CLAIMS

What is claimed is:

1. A switching regulator, comprising:

a power switch coupled between first and second terminals, the first terminal to be coupled to an energy transfer element of a power supply and the second terminal to be coupled to a supply rail of the power supply;

a drive signal generator circuit coupled to a third terminal to receive a feedback signal representative of an output of the power supply, the drive signal generator to generate a drive signal coupled to control switching of the power switch responsive to the feedback signal, the drive signal generator circuit to selectively disable each on period of the drive signal in response to the feedback signal to regulate the output of the power supply; and

a current limit circuit coupled to the power switch and the drive signal generator circuit to control the drive signal to limit a current flow through the power switch, the current limit circuit having a plurality of current limit settings for the power switch selected responsive to the feedback signal.

2. The switching regulator of claim 1 wherein the plurality of current limit settings for the power switch includes a finite number of current limit settings for the power switch.

3. The switching regulator of claim 1 wherein the drive signal generator circuit is coupled to selectively maintain an on time of a current cycle of the drive signal and not allow an on time of a next cycle of the drive signal in response to the feedback signal.

4. The switching regulator of claim 1 wherein the drive signal generator circuit is coupled to maintain an on time of a current cycle of the drive signal until a current flowing through the power switch reaches a selected one of the plurality of current limit settings for the power switch.

5. The switching regulator of claim 1 wherein the drive signal generator circuit comprises a state machine coupled to select among the plurality of current limit settings of the current limit circuit responsive to a pattern of feedback signal values for a plurality of preceding drive signal cycles.

6. The switching regulator of claim 5 wherein the pattern of feedback signal values for a plurality of preceding drive signal cycles includes consecutive feedback signal values within one of two ranges for a plurality of N drive signal cycles.

7. The switching regulator of claim 1 wherein a maximum power delivered to the output of the power supply for one of the plurality of current limit settings of the current limit circuit when the power supply operates at a maximum

on/off cycle ratio is greater than a minimum power delivered to the output of the power supply for a next higher one of the plurality of current limit settings of the current limit circuit when the power supply operates at a minimum on/off cycle ratio.

8. The switching regulator of claim 1 wherein the energy transfer element comprises a transformer.

9. The switching regulator of claim 8 wherein a flux density of the transformer is such that audio noise produced by the transformer is not audible when operating in an audio frequency range at a lowest one of the plurality of current limit settings of the current limit circuit.

10. The switching regulator of claim 9 wherein an upper end of the audio frequency range is approximately 20 kHz.

11. The switching regulator of claim 5 wherein the state machine is coupled to operate in one of a plurality of states to select the plurality of current limit settings for the power switch.

12. The switching regulator of claim 11 wherein the plurality of states includes a first state, a second state and a third state and wherein the plurality of current limit settings for the power switch includes a first current limit, a second

current limit and a third current limit, wherein the first current limit is selected when the state machine operates in the first state, wherein the second current limit is selected when the state machine operates in the second state and wherein the third current limit is selected when the state machine operates in the third state, wherein the second current limit is greater than the first current limit and the third current limit is greater than the second current limit.

13. The switching regulator of claim 12 wherein the state machine is coupled to transition directly from the first state to the third state in response to the pattern of feedback signal values for the plurality of preceding drive signal cycles.

14. The switching regulator of claim 12 wherein the state machine is coupled to transition directly from the third state to the first state in response to the pattern of feedback signal values for the plurality of preceding drive signal cycles.

15. The switching regulator of claim 12 wherein the plurality of states includes a fourth state in which the drive signal generator circuit is disabled from selectively disabling each on period of the drive signal in response to the feedback signal to regulate the output of the power supply.

16. The switching regulator of claim 15 wherein the plurality of current limit settings includes a first current limit setting and a second current limit setting, the current limit circuit to limit the current flow through the power switch to the first current limit setting when the feedback signal is within a first range of two ranges, the current limit circuit to limit the current flow through the power switch to the second current limit setting when the feedback signal is within a second range of two ranges.

17. A power supply, comprising:

an energy transfer element having an energy transfer element input and an energy transfer element output coupled to an output of the power supply;

a power switch coupled between the energy transfer element input and a supply rail of the power supply;

a drive signal generator circuit coupled to receive a feedback signal representative of the output of the power supply, the drive signal generator to generate a drive signal coupled to control switching of the power switch responsive to the feedback signal, the drive signal generator circuit to selectively disable each on period of the drive signal in response to the feedback signal to regulate the output of the power supply; and

a current limit circuit coupled to the power switch and the drive signal generator circuit to control the drive signal to limit a current flow through the power switch, the current limit circuit having a plurality of current limit settings for the power switch selected responsive to the feedback signal.

18. The power supply of claim 17 wherein the energy transfer element comprises a primary winding coupled to the energy transfer element input and a secondary winding coupled to the energy transfer element output, wherein the current limit circuit is coupled to limit the current flow through the primary winding.

19. The power supply of claim 17 wherein the energy transfer element comprises a transformer.

20. The power supply of claim 18 wherein the drive signal oscillates at a frequency greater than an audio frequency range if a flux density of the energy transfer element is at a value that causes the transformer to generate audible noise when driven by the drive signal.

21. The power supply of claim 20 wherein an upper limit end of the audio frequency range is approximately 20 kHz.

22. The power supply of claim 17 wherein the plurality of current limit settings for the power switch includes a finite number of current limit settings for the power switch.

23. The power supply of claim 17 wherein the drive signal generator circuit comprises on/off control circuitry coupled to generate the drive signal, the on/off control circuitry coupled to selectively disable the on period of each cycle of the drive signal responsive to the feedback signal.

24. The power supply of claim 23 wherein the drive signal generator circuit disables a cycle of the drive signal from being generated responsive to the feedback signal.

25. The power supply of claim 17 wherein the drive signal generator circuit comprises a state machine coupled to select among the plurality of current limit settings of the current limit circuit responsive to a pattern of feedback signal values for a plurality of preceding drive signal cycles.

26. The switching regulator of claim 25 wherein the pattern of feedback signal values for a plurality of preceding drive signal cycles includes consecutive feedback signal values within one of two ranges for a plurality of N drive signal cycles.

27. A method for regulating a power supply, comprising:

switching a power switch coupled in series with an energy transfer element of the power supply with a drive signal to control an amount of power delivered to an output of the power supply;

selectively disabling a cycle of the drive signal from being generated responsive to the output of the power supply;

selecting one of a plurality of current limit settings responsive to the output of the power supply; and

limiting a current flow through the power switch in response to the selected one of the plurality of current limit settings.

28. The method for regulating the power supply of claim 27 wherein selecting one of the plurality of current limit settings comprises changing states in a state machine responsive to output values of the output of the power supply for a plurality of preceding drive signal cycles.

29. The method for regulating the power supply of claim 28 wherein changing states in a state machine responsive to output values of the output of the power supply comprises counting a number of consecutive output values of the output of the power supply within a first range of output values of the output of the power supply for a plurality of N drive signal cycles

30. The method for regulating the power supply of claim 27 wherein selectively disabling a cycle of the drive signal from being generated comprises:

maintaining an on time of a current cycle of the drive signal; and

disabling an on time of a next cycle of the drive signal in response to the output values of the output of the power supply.

31. The method for regulating the power supply of claim 27 further comprising maintaining a frequency of the drive signal above an audio frequency range for flux density values of the energy transfer element that are greater than a flux density threshold value.

32. The method for regulating the power supply of claim 30 wherein the flux density threshold value is a lower end of a range of flux density threshold values of the energy transfer element that result in a generation of audible noise from the energy transfer element if operated within the audio frequency range.